

## Soil Profile Type

### Type I

1. ( Shear wave velocity greater than 2,500 ft/s)  
Rock, either shale-like or crystalline in nature.
2. Stiff clays or dense sands and gravels where the depth to bedrock is less than 200 ft.

### Type II

Stiff clays or dense sands and gravels where the depth to bedrock is greater than 200 ft

### Type III

30 feet or more of soft to medium stiff clays and loose to medium dense sands and gravels.

### Type IV

( Shear wave velocity less than 500 ft/s)  
40 feet or more of soft clays or silts

Table 5. Typical values of initial shear Modulus- Page 82-FHWA-SA-97-076

Type of Soil	Initial Shear Modulus, Gmax (tsf)
Soft Clays	28.7 – 143.6
Firm Clays	72 – 360
Silty Sands	288 – 1441
Dense Sands and Gravel	721 – 3603

Firm = medium stiff

$$G_{\max} = 240N_{60}^{0.8} \text{ (kip/ft}^2\text{.) Ohsaki \& Iwasaki 1973}$$

$$G_{\max} = 12,000N_{60}^{0.8} \text{ (kPa)}$$

$$G_{\max} = \rho V_s^2$$

$V_s$  (m/s or ft/s) = Shear Velocity

$\rho$ =soil density or from correlations to standard penetration tests.  $\rho = \gamma_t / g$

$$\text{EX. } 120\text{lb/ft}^3 / 32.2\text{ft/sec}^2 = 3.72 \text{ lb/ft}^4/\text{s}^2 = \rho$$

$$\begin{aligned} V_s &= \text{Square Root } (G_{\max}/\rho), \\ &= \text{Square Root } (28.7 \text{ tsf} \times 2000\text{lb/ton} / 3.72\text{lb/ft}^4/\text{s}^2) \\ &= 124 \text{ ft/sec} \end{aligned}$$

Type of Soil	Initial Shear Velocity, (ft/s)
Soft Clays	124 – 278
Firm( Medium Stiff) Clays	197 – 440
Silty Sands	394 – 880
Dense Sands and Gravel	622 - 1392